June 11, 1940. W. OGILVIE 2,204,441

THREAD-CUTTING DEVICE FOR LATHES

Filed April 22, 1939 4 Sheets-Sheet 1

Fig. 1.

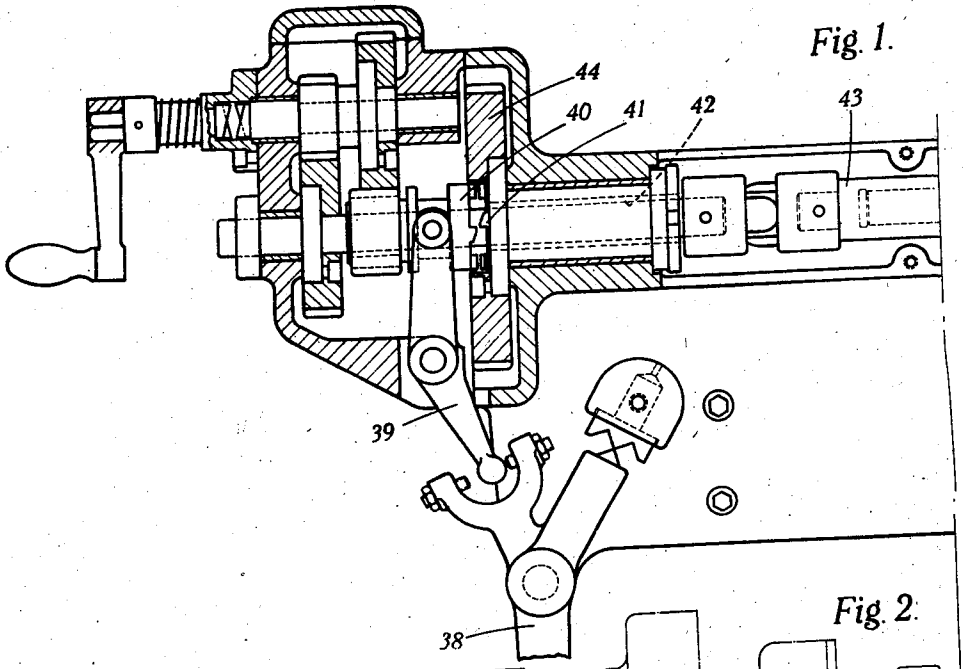
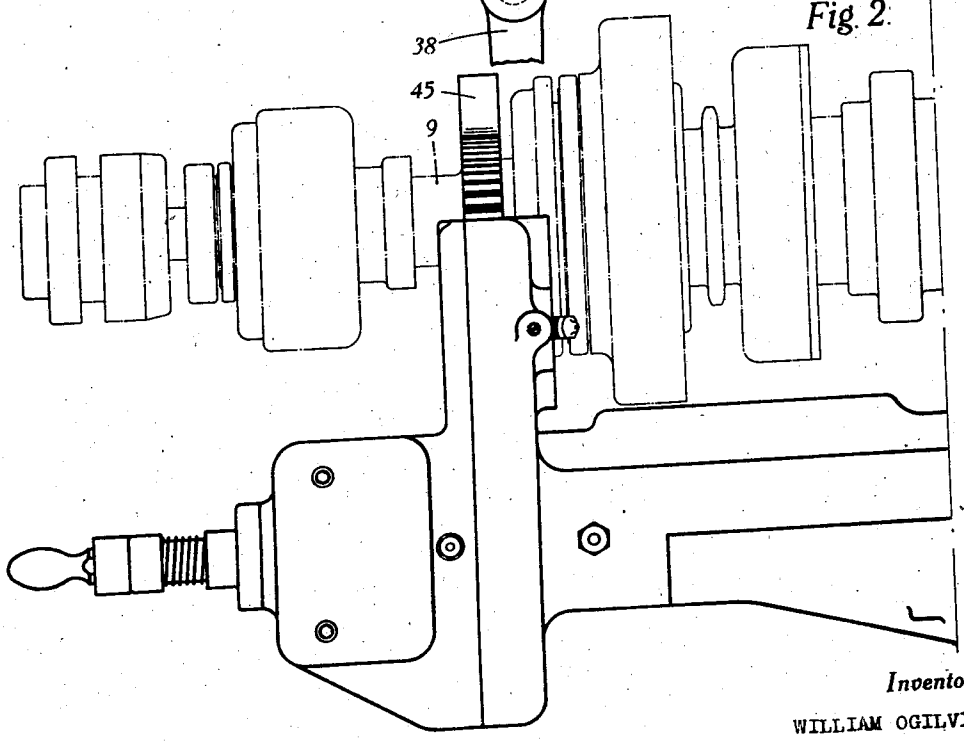


Fig. 2.



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Filed April 22, 1939 4 Sheets-Sheet 2

Fig. 1.a

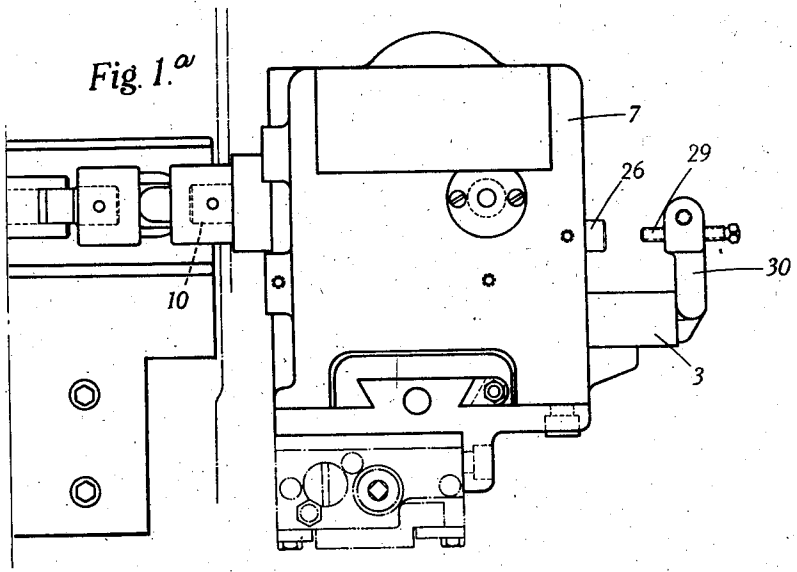
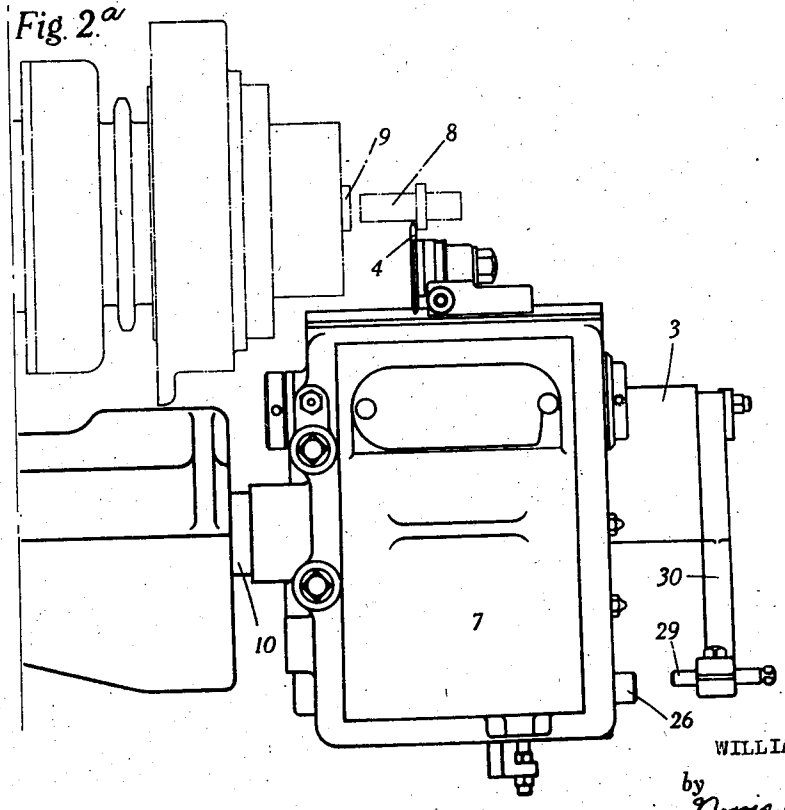


Fig. 2.a



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THREAD-CUTTING DEVICE FOR LATHES

Filed April 22, 1939 4 Sheets-Sheet 3

Fig. 3.

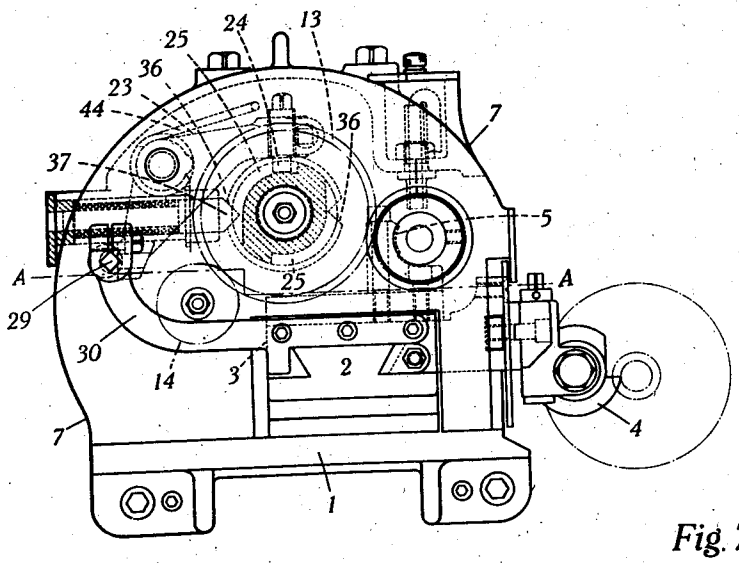


Fig. 7.

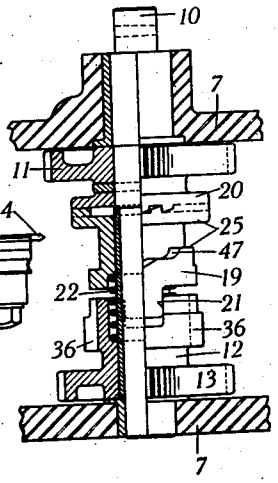
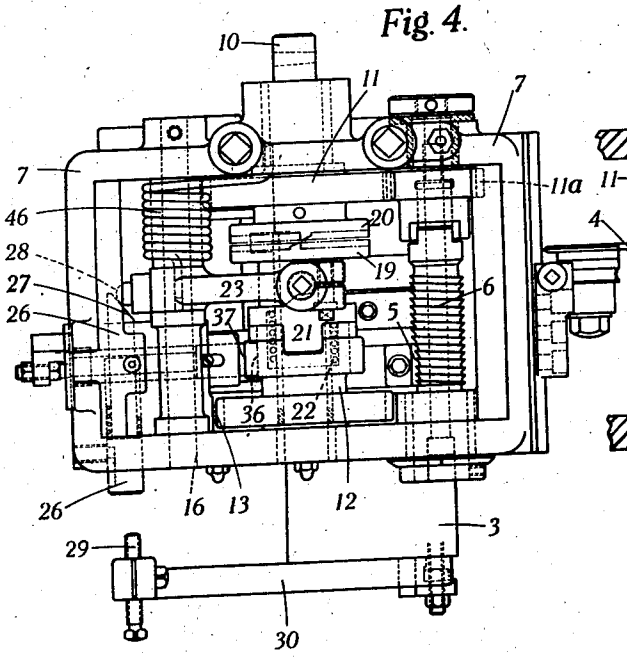


Fig. 4.



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THREAD-CUTTING DEVICE FOR LATHES

Filed April 22, 1939 4 Sheets-Sheet 4

Fig. 6.

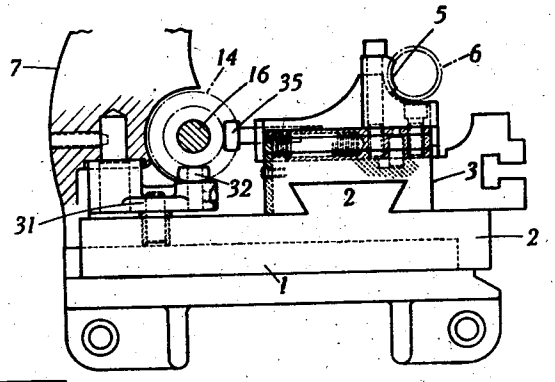


Fig. 9.

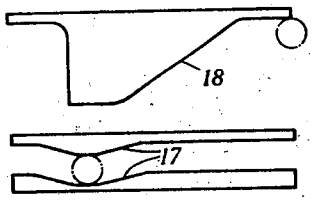


Fig. 8.

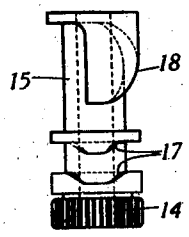
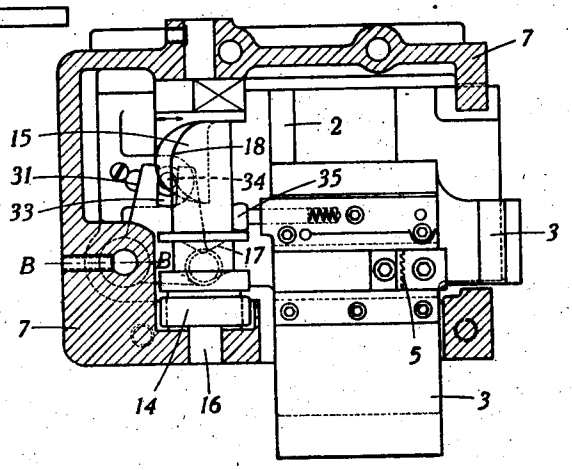


Fig. 5.



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Patented June 11, 1940 2,204,441

UNITED STATES PATENT OFFICE

2,204,441

THREAD-CUTTING DEVICE FOR LATHES

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Application April 22, 1939, Serial No. 269,516
In Great Britain May 3, 1938

7 Claims. (Cl. 82—5)

This invention relates to thread-cutting devices for use in single or multi-spindle lathes, and refers more particularly to the kind wherein a thread cutting tool is carried on a compound slide operated by mechanism which is adapted to impart a longitudinal feed traverse to the cutter in the operation of thread-cutting, retract the cutter from the work piece by a transverse movement of the slide, return same to the commencement of the feed traverse, and move the cutter into engagement with the work piece, when the operation as above described can automatically be repeated any desired number of passes according to the depth of thread it is desired to cut.

In thread-cutting devices of the aforesaid kind, it has been previously proposed to impart longitudinal feed traverse to the slides carrying the cutter, by means of a rotatable but longitudinally confined lead screw, arranged to be engaged by a lead nut, in conjunction with means whereby the lead nut is disengaged, the cutter withdrawn, and the slides returned to the initial operative position in which the tool is again moved into operative contact with the work piece.

The object of the invention is to provide new or improved means for effecting a transverse movement of the cutter and a longitudinal return movement of same to its initial operative position.

According to this invention, in a thread-cutting device of the aforesaid kind, wherein the lead screw is mounted in a housing fixed to a base part on which is carried the compound slide, I provide means for effecting the transverse and the longitudinal return movement of the cutter to its initial operative position comprising a constantly driven clutch shaft geared to the lead screw, a sleeve rotatably mounted on said clutch shaft and geared to an intermittently rotatable cam shaft, a slidable clutch member on the clutch shaft adapted to be actuated by the longitudinally movable slide when the cutter reaches the end of its feed traverse whereby the clutch is engaged and rotary motion imparted to the cam shaft, a cam track on said cam shaft operating through a pivoted lever arranged to impart a transverse movement to the compound slide, a cam face on said cam shaft arranged to engage with a peg or roller on the longitudinally movable member of the compound slide whereby the cutter is returned to the commencement of its feed traverse, when the aforesaid cam track, through its associated pivoted lever then imparts a reverse transverse movement to the compound slide which brings the lead nut into engagement with the lead screw, and the cutter into engagement with the work piece, and means whereby the clutch is disengaged and rotation of the cam shaft arrested to permit of a succeeding forward feed movement of the cutter when the operation, as above stated, may be repeated any desired number of passes.

In order that the invention may be clearly understood and readily carried into practical effect, I will now describe same with reference to the accompanying drawings, in which:

Figures 1 and 1ª are collectively a part sectional front elevation of a machine provided with thread-cutting mechanism constructed in accordance with this invention.

Figures 2 and 2ª are collectively a plan view of the machine.

Figure 3 shows an end elevation of the thread-cutting mechanism, on an enlarged scale.

Figure 4 is a plan view of the mechanism shown in Figure 3, with the cover plate removed.

Figure 5 is a sectional plan view taken on line A—A, Figure 3.

Figure 6 is a part sectional end elevation taken on line B—B, Figure 5.

Figure 7 is a part sectional and part plan view of the clutch shaft on which the clutch mechanism is moved to its engaged position.

Figure 8 is a plan view of the cam sleeve.

Figure 9 shows a development of the cams.

According to one convenient mode of carrying the invention into effect, as illustrated, in its application to a thread-cutting device comprising a base part 1 on which is mounted a compound slide the lower member 2 of which is transversely movable and the upper member 3 is longitudinally movable on said lower member and has mounted thereon a cutter 4 and a resiliently mounted half-nut or lead nut 5 adapted to engage with a lead screw 6 rotatably mounted but longitudinally confined in a housing 7 mounted on the aforesaid base part 1, the said lead nut 5 being adapted, when moved into engagement with the constantly revolving lead screw 6, to impart a longitudinal feed traverse to the cutter 4 along the work piece 8 mounted on the work spindle 9 of the machine, I mount in the aforesaid housing 7 a clutch shaft 10 which is connected by suitable gearing with the work spindle 9, and has fixed thereto a pinion 11 arranged to engage with a pinion 11a on the lead screw 6, as seen in Figure 4, and is preferably rotated at one half the speed of the latter. On the clutch shaft 10 is freely mounted a sleeve 12 on which is formed or fitted a pinion 13 ar-

ranged to engage with a pinion 14 on a cam sleeve 15 rotatably mounted on a spindle 16 fixed in the aforesaid housing 7 parallel in relation to the clutch shaft 10 and arranged to be intermittently rotated at twice the speed of said clutch shaft.

On the aforesaid cam sleeve 15 are formed two cams 17 and 18, the cam 17 being adapted to impart a transverse movement to the compound slide in order to withdraw the cutter 4 and disengage the lead nut 5 from the lead screw 6, while the other cam 18 is adapted, in the manner hereafter described, to impart longitudinal movement to the upper slide 3 on which is mounted the cutter 4 and lead nut 5, to effect the return movement of same to the initial operative position.

Also on the clutch shaft 10 is slidably and freely mounted a clutch member 19 provided with facial clutch teeth arranged for engagement with facial clutch teeth on a member 20 fixed to the aforesaid constantly revolving clutch shaft 10, the said slidable clutch member 19 having a tail part or driving tang 21 which slidably engages with slots formed in the pinion sleeve 12 freely mounted on said shaft 10, and is adapted to be held in its disengaged position, as seen in Figure 4, against a suitable spring 22, by means of a rocking lever 23 pivotally mounted in the housing 7, one arm of said lever being provided with a peg 24 arranged to engage with a cam slot 25 on the slidable clutch member 19 whereby, as seen in Figures 3 and 4, the clutch is held in its disengaged position against the action of the spring 22 of the said movable clutch member 19, and is released from said engagement to permit of the clutch becoming operative, when the slide 3 reaches the end of its longitudinal feed travel in the cutting of the screw thread. In one convenient arrangement such is effected by means of a spring controlled sliding bar 26 mounted in the housing 7, said bar having formed on its inner end an inclined face 27 arranged to engage with a part spherical face 28 formed on the end of the other arm of the rocking lever 23, the other end of said bar 26 being arranged to protrude through the outer wall of the housing 7, and is arranged to be engaged by an adjustable screw 29 carried in an arm 30 fixed to the longitudinally movable slide 3, so that when the latter reaches the end of its feed travel the said rocking lever 23 is released from engagement with the slidable clutch member 19, and the clutch is thus made operative whereby the clutch shaft 10 then rotates the cam sleeve 15.

Upon rotation of the cam sleeve 15, movement is imparted to the transversely movable slide 2 whereby the cutter 4 is withdrawn and the lead nut 5 disengaged from the lead screw 6, such being effected, as seen in Figures 5 and 6, through a pivoted lever 31, one arm of which is provided with a peg or roller 32 arranged to engage with the cam groove 17 in the cam sleeve 15, while the other end of said lever has formed therein a slot or gap 33 arranged to engage with a peg or projection 34 on the transversely movable slide 2. On the cam sleeve 15 is formed a second cam 18 which engages with a spring loaded peg or roller 35 mounted on the longitudinally movable slide 3, such being adapted to impart return movement to said slide whereby the cutter 4 and the lead nut 5 thereon are returned to the commencement of the feed travel, when the first cam 17 imparts inward movement to the transverse slide 2 which brings the lead nut 5 into engagement with the lead screw 6, and the cutter 4 into operative contact with the work piece 8, when the operation as above described may be repeated.

On the sleeve part 12 of the pinion 13 which is freely mounted on the clutch shaft 10 and engages with a small pinion 14 on the cam sleeve 15, whereby the latter has imparted thereto a complete revolution for each half revolution of said clutch shaft, V gaps 36 are formed in the opposite sides thereof arranged to be engaged by a spring loaded bolt or catch 37 mounted in the housing 7 and adapted to limit the rotation of said sleeve and thus prevent the over running of same.

The operation of the device may be briefly stated as follows: The mechanism is set in motion by movement of the operating lever 38 shown in Figure 1, whereby through the rocking lever 39 the slidable clutch member 40 is moved into engagement with clutch member 41 fixed to the shaft 42 which is connected by a driving shaft 43 to the clutch shaft 10, and rotary motion is then imparted to the latter from the constantly revolving work spindle 9 through the gearing 44 and 45, as seen in Figures 1 and 2. In the arrangement as shown in Figures 3 and 4, the lead nut 5 is shown in its engaged position with the lead screw 6, ready to impart longitudinal movement to the slide 3 and a feed traverse to the cutter 4, upon rotary motion being imparted to said lead screw by the clutch shaft 10 through the gearing 11, 11*a*, and during the aforesaid feed traverse of the cutter the slidable clutch member 19 is held in its disengaged position by the peg 24 on the rocking lever 23. When the cutter has nearly reached the end of its feed travel, the adjustable screw 29, mounted on the arm 30 fixed to the longitudinally movable slide 3, engages with and moves inward the spring loaded bar 26, which in turn imparts, through the inclined face 27 on the inner end thereof, movement to the rocking lever 23 by its engagement with the part spherical face on one arm of the said rocking lever, whereby the peg 24 on the other arm of said rocking lever is lifted from engagement with the slidable clutch member 19, which permits the said clutch member to be moved under the action of its spring 22 into engagement with the clutch teeth on the clutch member 20 fixed to the clutch shaft 10, as seen in Figure 7, thus permitting said shaft to now impart rotary movement through the constantly engaged pinions 13 and 14 to the cam sleeve 15 when the first cam 17 thereon imparts through its associated pivoted lever 31 an outward movement to the transverse slide 2, thus releasing the lead nut 5 from the lead screw 6 and retracting the cutter 4 from the work piece 8, and the peg or roller 35 on the longitudinally movable slide 3 is then engaged by the second cam 18 on the cam sleeve 15 which returns the said slide, and the cutter 4 and lead nut mounted thereon, to the commencement of its feed traverse, when the first cam 17 again operates and moves the transverse slide 2 inwards thus bringing the lead nut 5 into engagement with the lead screw 6 and the cutter 4 into contact with the work piece 8. During the first part of the return travel of the longitudinally movable slide 3, when the adjustable screw 29 thereon has moved from engagement with the spring controlled bolt 26, the latter moves outward and permits the rocking lever 23 under the action of a torsion or other suitable spring 46, to turn, thus bringing the pin 24 thereon into engagement with an annular groove 25 in the slidable clutch member 19, as seen in Figures 3 and 4. In the said groove 25 are formed cam faces 47, as seen in Figure 7, so disposed that when the cam

shaft 10 has nearly completed a half revolution, the said slidable clutch member 19 is caused to move backward against its spring 22 out of engagement with the clutch teeth on the clutch member 20 fixed to the clutch shaft 10, as seen in Figure 4, and the spring loaded bolt or catch 37, mounted in the housing 7, moves into engagement with one of the V notches 36 in the sleeve part 12 of the pinion 13 which engages with and rotates the cam sleeve 15, immediately after the cam 17 therein has moved the transverse slide 2 to bring the lead nut 5 into engagement with the lead screw 6, as seen in Figure 4, and the cutter 4 into contact with the work piece 8 for the commencement of the next feed traverse of the cutter, during which the cam sleeve is at rest.

When the lead nut 5 and the cutter 4 again reach the end of their feed traverse, the operations of the device, as previously described, are repeated.

The device is adapted for use in cutting single or multi-start screw threads, by the use of lead screws corresponding to the screw thread it is desired to cut, and in the cutting, of multi-start threads, by regulation of the adjusting screw on the longitudinally movable slide in order to adjust and control the movement of the transverse slide, and the engagement of the lead nut thereon with the lead screw in relation to a part of a complete revolution of the latter.

Having thus described my invention, what I claim is:

1. In a thread-cutting device for lathes wherein the longitudinal feed traverse of the cutter is effected by means of a lead screw, the provision of means for effecting the transverse and longitudinal return movement of the cutter to its initial operative position, comprising a constantly driven clutch shaft geared to the lead screw, a sleeve rotatably mounted on said clutch shaft and geared to an intermittently rotatable cam shaft, a slidable clutch member on the clutch shaft actuated by the longitudinally movable slide when the cutter reaches the end of its feed traverse, a cam track on said cam shaft operating through a pivoted lever arranged to impart a transverse movement to the compound slide, a cam face on said cam shaft arranged to engage with a peg or roller on the longitudinally movable member of the compound slide whereby the cutter is returned to the commencement of its feed traverse, and means whereby the clutch is disengaged and rotation of the cam shaft arrested to permit of a succeeding forward feed movement of the cutter.

2. In a thread-cutting device for lathes according to claim 1, means for imparting a transverse movement to the compound slide carrying the lead nut and cutter comprising an intermittently rotatable cam shaft provided with a cam track, a pivoted lever mounted in a fixed housing, one arm of said lever being provided with a peg or roller arranged to engage with the cam track on the cam shaft, while the other arm of said lever has formed therein a slot arranged to engage with a peg or projection on the transversely movable slide.

3. In a thread-cutting device for lathes according to claim 1, including means for imparting longitudinal movement to the compound slide comprising a cam face on said intermittently rotatable cam shaft arranged to be engaged by a peg or projection on said longitudinally movable member of the compound slide, when the latter has been moved transversely to withdraw the cutter from engagement with the work piece, at the end of the feed traverse.

4. A thread-cutting device for lathes according to claim 1, wherein said sleeve is freely mounted on said clutch shaft and is geared to said cam shaft so that a half revolution of the clutch shaft imparts one complete revolution to the cam shaft, and wherein said sleeve has formed in opposite sides thereof V-grooves, and a spring loaded bolt or catch, mounted in a fixed housing, is engageable with said grooves to limit or control the intermittent to a half rotary movement of said sleeve and thereby prevent overrunning of same.

5. A thread-cutting device for lathes according to claim 1, wherein said sleeve is keyed to a longitudinally slidable clutch member which is mounted on said clutch shaft and is normally moved under the action of a spring into clutch engagement with said clutch shaft, to effect the return movement of the longitudinally movable slide and the cutter.

6. A thread-cutting device for lathes according to claim 1, wherein said slidable clutch member on said clutch shaft is keyed to said sleeve and is moved to its disengaged position by means of a rocking lever arranged to be actuated through said longitudinally movable slide, said rocking lever being provided with a peg or roller which is moved into engagement with a circumferential groove in said clutch member, said groove having formed therein cam faces which withdraw said member from clutch engagement with the clutch shaft at the end of each half revolution of said clutch shaft.

7. A thread-cutting device for lathes according to claim 1, wherein said slidable clutch member on said clutch shaft is keyed to said sleeve and is moved to its disengaged position by means of a rocking lever arranged to be actuated through said longitudinally movable slide, said rocking lever being provided with a peg or roller which is moved into engagement with a circumferential groove in said clutch member, said groove having formed therein cam faces which withdraw said member from clutch engagement with the clutch shaft at the end of each half revolution of said clutch shaft, said rocking lever being moved under the action of a spring into engagement with the circumferential groove in the slidable clutch member, and moved from engagement with said clutch member by means of a spring loaded sliding bar mounted in a fixed housing, and arranged to be engaged by an adjustable member mounted on the longitudinally movable slide, when said slide and the cutter are nearing the end of the feed traverse.

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